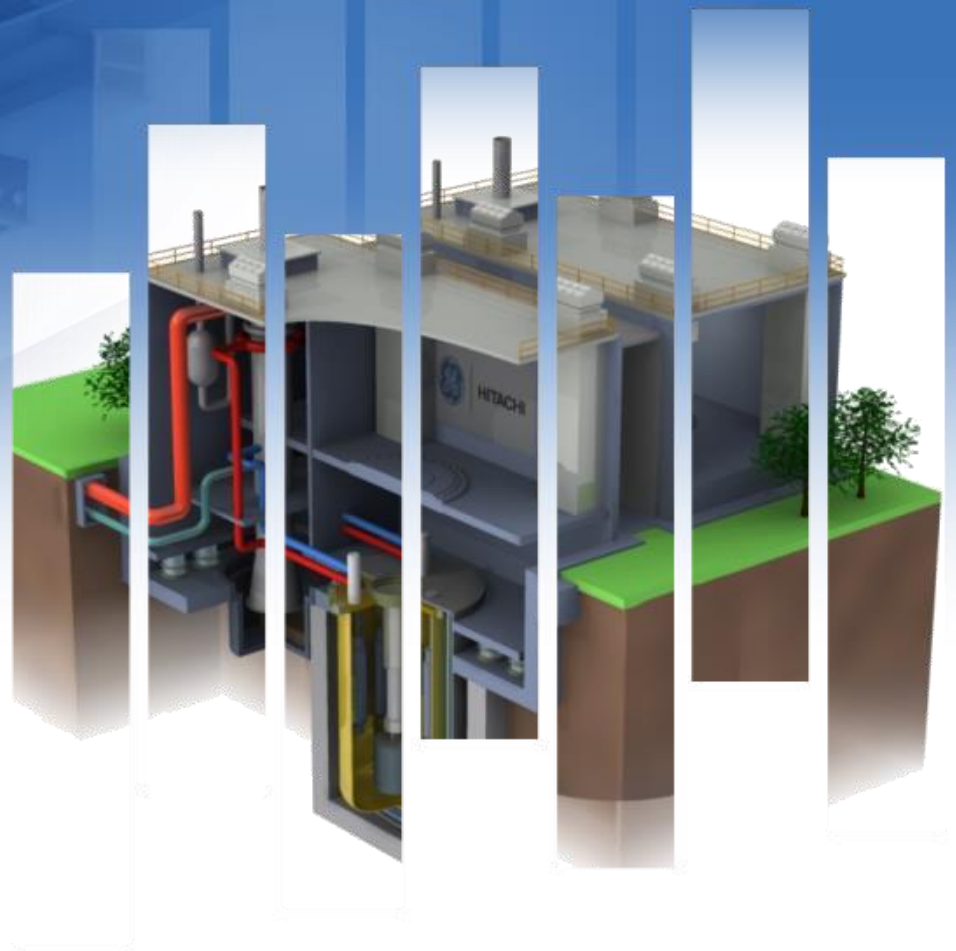
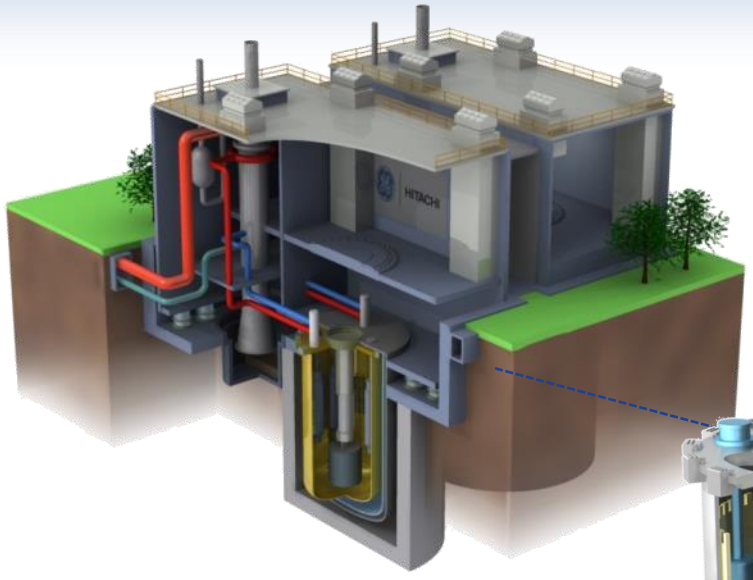


PRISM & U.S. Licensing

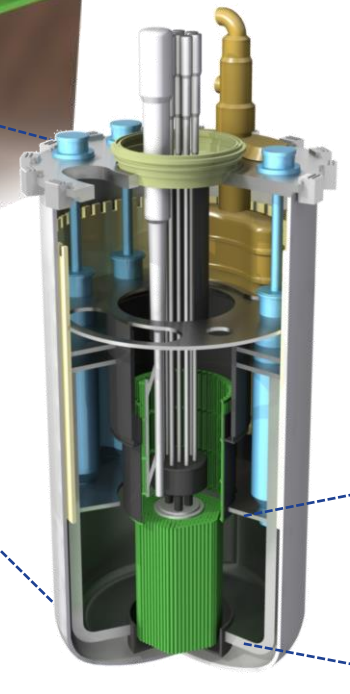
Original Use Date: 07 June 2016

Scott Rasmussen, Vice President, PRISM Product Line
Eric Loewen, Ph.D., Chief Engineer

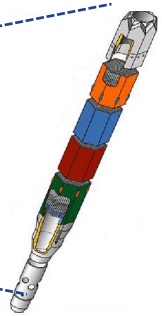
What is PRISM?



Power Reactor Innovative Small Module (PRISM)



- 311 MWe (840 MWth) per reactor
  - Two reactors per turbine-generator
- Modular components allow for factory fabrication
- Design prevents Loss of Coolant Accident
- Design removes decay heat without automatic or operator actions
- Metallic fuel



Metallic fuel is key

Decades of technology development without a license

PRISM related technology programs

1981-1984 GE Program

GE funded
- Innovative design approaches

1985-1987 PRISM

DOE funded $30M
- Competitive LMR concepts

1988 PRDA

DOE funded $5M
- Continuing trade studies

1989-1995 ALMR

DOE funded $42M
- Preliminary design
- Regulatory review
- Economics
- Commercialization
- Tech development ($107M additional)

1995-2002 S-PRISM

GE Funded
- Improved economics
- Actinide burning scenarios

2007-2014 GNEP

- Demo reactor
- Actinide burning
- Commercial
- Best practices
- Advanced power conversion cycle

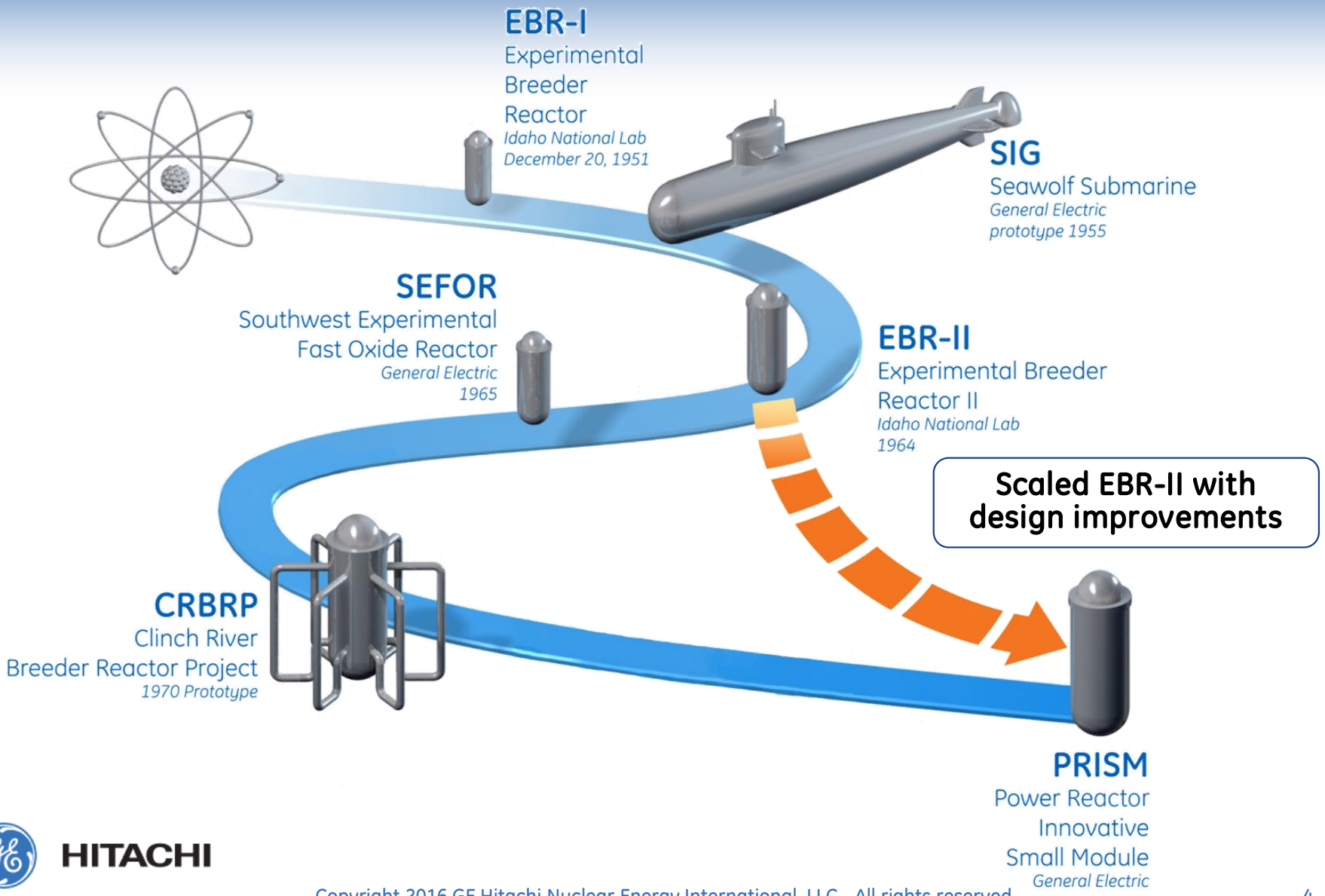
✓ **Advanced Conceptual Design**
- Development sponsored by US Government
- Various US development programs since 1985

✓ **Nuclear Regulatory Commission: "no obvious impediments to licensing"**

PRISM Conceptual Design Document

- PRDA - Program Research & Development Announcement
- ALMR – Advanced Liquid Metal Reactor program
- GNEP – Global Nuclear Energy Partnership

Licensed sodium cooled reactors have operated



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First step: General Design Criterion (GDC)

- Establish fundamental requirements (GDCs)
- Expedite finalizing & published (NUREG or RG)
  - Utilize industry to complete inputs
  - Simplify language and redundancy

Second Step: Establish Process for going forward

- Streamline process:
  - Part 52 for "Certification" of a standard design is UNWORKABLE for any advanced reactor.
  - NRC bill for ESBWR approached $70MM; ESBWR was not a "quantum leap" in technology (coolant, fuel, etc.)
  - Current NRC processes led to cost and schedule uncertainty, making project difficult to complete.
- Re-invigorate use of prototype allowance (10CFR 50.43(e))
  - Demo plant licensing drives certification of follow-on units
  - Agreement on component testing details and milestones
  - Use exceptions/exemptions where LWR requirements are not adequate or not applicable to drive decision making

Second Step: Establish Process for going forward

10CFR 50.43(e)

"…If a prototype plant is used to comply with the testing requirements, then the NRC may impose additional requirements on siting, safety features, or operational conditions *for the prototype plant to protect the public and the plant staff from the possible consequences of accidents during the testing period."*

Third Step: Recommendations - Expediting the review process

- Non water cooled reactors need a fundamental change to NRC processes – Prototype Allowance
- Train NRC staff on technologies before beginning the licensing review
  - Better inform the Prototype Allowance decision-making process
  - Informed agreement between parties based on standards, NRC Policy Statements, etc.
- Manage iterations jointly

What if …
advanced reactors were licensed by test?

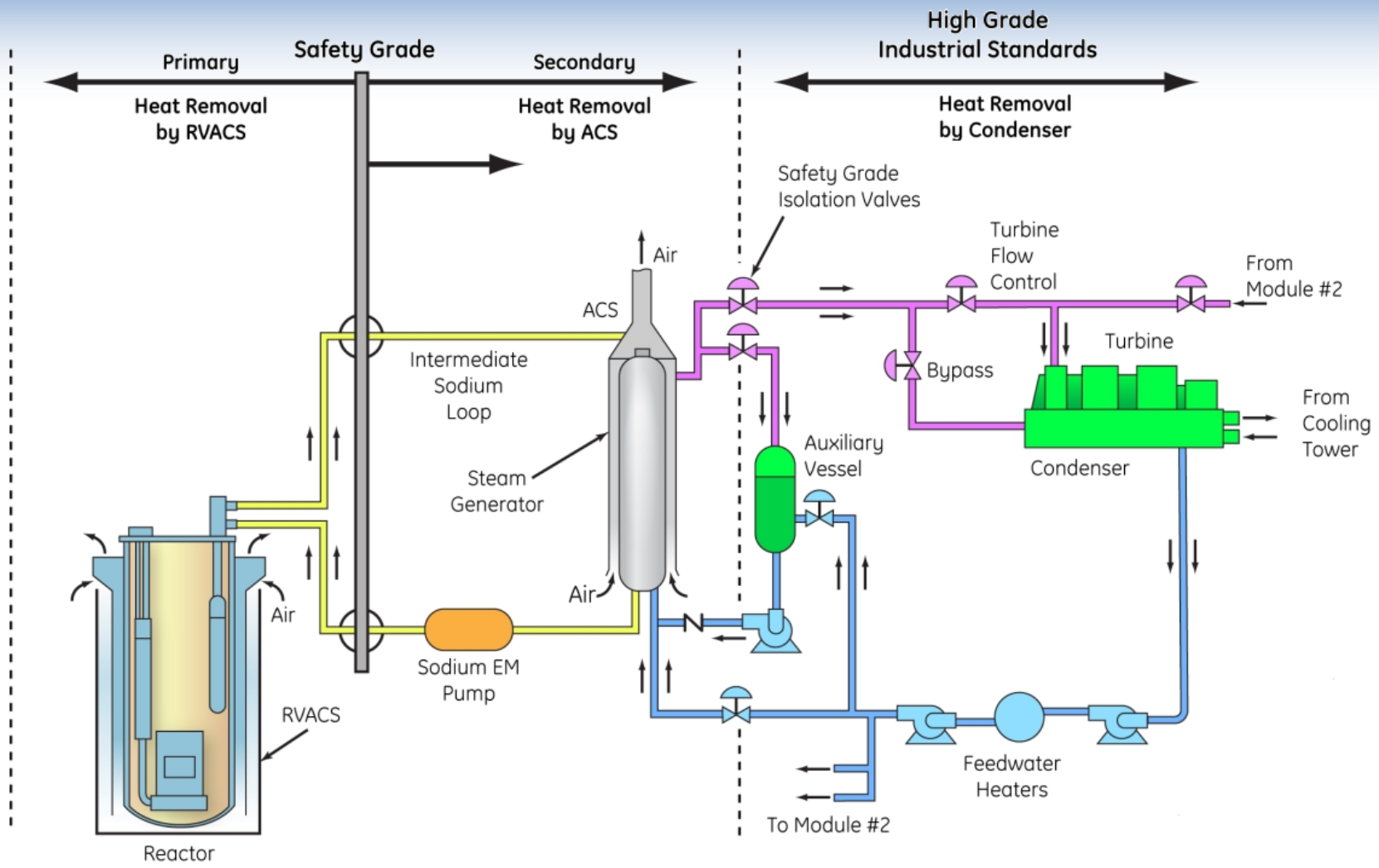
Today

- Multitude of RAI's have slowed communications and understanding
- No advanced reactor licenses yet … No company has yet found a way to effectively obtain a license

What's possible

- Reactors with inherent feedback to control the reactor power
- Direct removal of decay energy without external power
- "Affordable" nuclear implementation

PRISM: 3 independent heat transfer loops - inherent feedback controls reactor power



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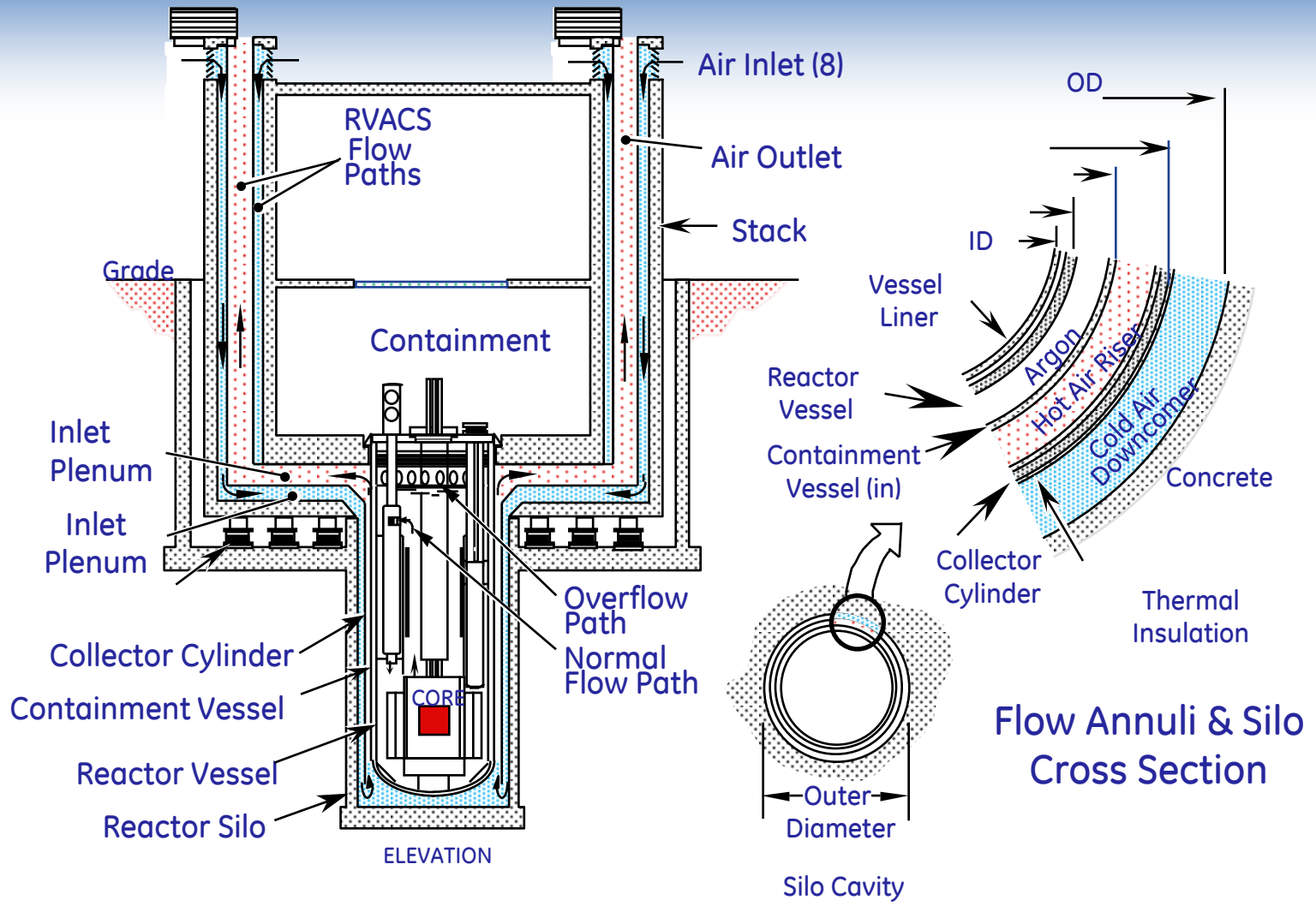
Passive safety - air cooling: Direct removal of decay energy without external power



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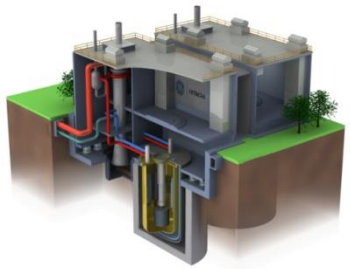
Licensing the first advanced reactor… affordably

3 Parallel Paths

Engineering Design

Status:
Preliminary design complete … NRC initial review complete



Path 1

Licensing

- Update Licensing Strategy
- Start Pre-Application Meetings
- Submit application & receive license

Path 2

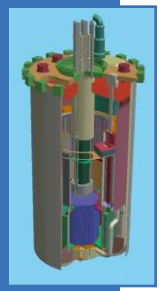
Simulation

- Build Analytical Simulator
- Start Design Optimization
- Select Component Scale Model Testing

Path 3

Component Testing

- Fabricate Select Components
  - Reactor Vessel
  - Fuel Handling Equipment
  - EM Pump
- Test Components



Recycling Reactor Deployment

- Integrate simulation into design process
- Optimize, validate, and iterate prior to construction

Benefits:

- Reduced time to deploy prototype
- Take advantage of existing LWR processes
- Optimize design through iteration

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Thank You

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